# ----- GENERAL INFORMATION -----

DATA TITLE:

Data for: Impact of cropping system diversification on vegetative and reproductive characteristics of waterhemp (*Amaranthus tuberculatus*)

DATA ABSTRACT:

We examined the relationship between waterhemp’s aboveground mass and fecundity when the weed species grew in association with four crop species’ within three crop rotation systems: a 2-year sequence of corn and soybean; a 3-year sequence of corn, soybean, and oat intercropped with red clover; and a 4-year sequence of corn, soybean, oat intercropped with alfalfa, and alfalfa. All the rotation systems were treated with conventional or reduced rates of herbicides. We established eighteen linear equations to predict waterhemp’s fecundity from dried aboveground mass in each crop and associated crop management program. Measuring plant mass allows for quicker estimation of fecundity compared to counting seeds on each individual plant.

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ASSOCIATED PUBLICATIONS: 10.3389/fagro.2022.811359

COLLECTION INFORMATION:

Time period(s): 2018 and 2019

Location(s): Agronomy Research Farm (Marsden), Boone, Iowa.

# ----- FILE DIRECTORY -----

The Clean folder consists of data sheets that were used for data analysis and the Raw folder data sheets that were manipulated, as detailed in the Appendix B of the associated publication, before being analyzed.

## ----- FILE LIST-----

1. Clean
   1. AMATA \_18\_clean.csv – contains the population stand density, population aboveground, and number of female and male waterhemp plants in each experimental unit in 2018.
   2. AMATA \_19\_clean.csv – contains the population stand density, population aboveground, and number of female and male waterhemp plants in each experimental unit in 2019.
   3. fecundity\_18.csv – contains the individual aboveground mass and fecundity of common waterhemp plants in 2018.
   4. sexed19\_m24\_Jan29\_22.csv – 24 imputed data sets of the number of female and male waterhemp plants in each experimental unit in 2019, using the raw data in sexed\_19\_mis.csv
2. Raw
   1. sexed\_19\_mis.csv – raw number of female and male waterhemp plants in each quadrat in each experimental unit in 2019.
   2. AMATA \_19\_raw.csv – raw number of female and male waterhemp plants in each experimental unit in 2019.

## ----- CODEBOOK -----

# Please refer to <https://github.com/hnguyen19/AMATA-fecundity/blob/master/2-Data/Data_dictionary.md>

# ----- METHODS AND MATERIALS -----

## ----- DATA COLLECTION METHODS -----

The detailed data collection procedure is available in the associated publication, but it is summarized briefly here.

Individual plant aboveground mass and fecundity regressions:

* In 2018, each experimental unit (eu) was scouted until eight to ten (or the maximum number of available) physiologically mature individual female waterhemp plants were collected from each eu. The collected plants were representative of the population in the eu in terms of physical appearance and the variance in plant size.

Population sex ratio:

* In 2018, each eu was scouted between September and November, according to crop harvest timing, until 100 plants or the maximum number of available plants were sexed.
* In 2019, a grid of 4x2 quadrats was fixed in each eu two to three weeks after crop planting (0.28 m2 in the oat and alfalfa phases, and 2.32 m2 in corn and soybean). All the waterhemp plants that were present were collected two to three weeks after oat harvest, two to three weeks after the last alfalfa hay cut, and one to two weeks before corn and soybean harvest. The plants were sexed and dried for aboveground mass assessment, but the female plants’ seeds were not counted.

Population density and aboveground mass:

* In 2018, a grid of 4x2 quadrats was sampled in each eu planting (0.28 m2 in the oat and alfalfa phases, and 2.32 m2 in corn and soybean) to determine whole-community weed composition. Waterhemp population density and aboveground mass were taken from this set of samples.
* In 2019, the sampling scheme for 2018 was repeated; the quadrats for population density and aboveground mass did not overlap the quadrats for waterhemp population sex ratio assessment.

## ----- DATA PROCESSING METHODS -----

# High herbicide control efficacy in 2019 resulted in a total absence of waterhemp in the fixed quadrats in the soybean plots, and thus, about 22% of the data was missing. This absence was addressed with an imputation procedure detailed in the Appendix B of the associated publication. The procedure filled NA values the “Female”, “Male” and “Total” columns with positive integers. The integers were algorithmically guessed using a “predictive mean matching” method.

# ------- SOFTWARE -------

**Data curation:**

Name: tidyverse

Version: 1.3.0

System Requirements: need R installed any dependents specified by tidyverse.

URL: <https://www.tidyverse.org>

Developer: Hadley Wickham, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, Alex Hayes, Lionel Henry, Jim Hester, Max Kuhn, Thomas Lin Pedersen, Evan Miller, Stephan Milton Bache, Kirill Müller, Jeroen Ooms, David Robinson, Dana Paige Seidel, Vitalie Spinu, Kohske Takahashi, Davis Vaughan, Claus Wilke, Kara Woo, and Hiroaki Yutani

Additional Notes: **10.21105**/**joss**.**01686**

**Data imputation:**

Name: mice

Version: 3.14.0

System Requirements: need R installed and any dependents specified by mice.

URL: https://github.com/amices/mice, https://amices.org/mice/, https://stefvanbuuren.name/fimd/

Developer: Stef van Buuren, Karin Groothuis-Oudshoorn, Gerko Vink, Rianne Schouten, Alexander Robitzsch, Patrick Rockenschaub, Lisa Doove, Shahab Jolani, Margarita Moreno-Betancur, Ian White, Philipp Gaffert, Florian Meinfelder, Bernie Gray, Vincent Arel-Bundock, Mingyang Cai, Thom Volker, Edoardo Costantini, and Caspar van Lissa

Additional note: [10.18637/jss.v045.i03](https://doi.org/10.18637/jss.v045.i03), please refer to <https://github.com/hnguyen19/AMATA-fecundity/blob/master/4-Data-wrangling/sex-19-imputation-jan29-22.Rmd> for specific maneuvering.

# ------- EQUIPMENT -------

1. PVC quadrats, in-house made by the Liebman Lab, Ames, Iowa, USA
2. Gravity vibration deck, in-house made by the ISU Seed Lab, Ames, Iowa, USA
3. Brushing machine, model LA-H, Westrup, Slageise, Denmark.
4. Sieves, US Standard Service Sieve Series, Central Scientific Co., Chicago, Illinois, USA
5. Shaker, model Dayton, Seedburo Equipment Company, Des Plaines, Illinois, USA
6. Seed blower, model CB-1, Agriculex, Guelph, Canada
7. Old Mill counter, model 850-3, International Marketing and Design Corp, San Antonio, Texas, USA
8. Optical counter, model Gen3, Ball Horticulture Company, Illinois, USA

------- LICENSING -------

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